IN THE CLAIMS:

Please amend claims 1, 4, 6, 9, 11-15, and 19-22 as follows.

Please add claims 23 and 24 as follows.

1. (Currently Amended) A data loading method in a communication system where sub-carriers include eigenmodes, the method comprising:

estimating a channel matrix;

calculating a singular value decomposition of the estimated channel matrix for obtaining eigenvalue estimates;

defining biases between eigenvalues and eigenvalue estimates and performing a channel estimation reliability test based on the defined biases;

carrying out bias compensation for eigenvalue estimates based on the defined biases;

calculating equivalent power gain;

arranging eigenmodes into a predetermined number of clusters, each cluster comprising eigenmodes of different quality levels;

pre-allocating transmission power to the eigenmodes according to their capacity by using the calculated equivalent power gain;

determining collective transmission power to be allocated to each cluster based on the pre-allocation; and

selecting the optimum modulation and coding scheme and allocating collective transmission power to the eigenmodes.

2. (Original) The method of claim 1, wherein the number of clusters is two and each cluster includes the strongest and the weakest eigenmodes of each sub-carrier.

3. (Original) The method of claim 1, wherein the pre-allocation of transmission power is carried out by using water filling or modified water filling power allocation method.

4. (Currently Amended) The method of claim 1, wherein the communication system is a combined multiple-input-multiple output ~~(MIMO)~~ and orthogonal frequency division multiplexing ~~(OFDM)~~ system.

5. (Original) The method of claim 1, wherein the transmission power allocating to eigenmodes is started from the weakest cluster.

6. (Currently Amended) The method of claim 1, wherein the optimum modulation and coding scheme ~~(MCS)~~ which ~~maximises~~ maximizes the throughput under the total transmitted power and the maximum frame error rate ~~(FER)~~ constraints is found by using:

$$k_0 = \arg\max_{k=1,2,\ldots,K} b_k \left(\max_{S\subset\{1,2,\ldots,C\}:\sum_{c\in S}\tilde{P}_c(\gamma_k)\le P} |S| \right) = \arg\max_k b_k s_k \, .$$

7. (Original) The method of claim 1, wherein the power required at the eigenmode (i,c) in order to obtain a given target signal to noise ratio, SNR_t, is given by:

$$\tilde{P}_{i,c}(\mathrm{SNR}_t) = \mathrm{SNR}_t \frac{N_0}{g_{i,c}} \quad .$$

8. (Original) The method of claim 1, wherein according to the modified water filling, the power to be pre-allocated for an eigenmode is expressed:

$$P_{i,c}^{(\mathrm{MWF})} = \min\left[\left(\mu - \frac{N_0}{g_{i,c}} G \right)^+ , \frac{N_0}{g_{i,c}} \gamma_K \right] .$$

9. (Currently Amended) The method of claim 1, wherein the powers allocated to the cluster's ~~eigemodes~~ eigenmodes are computed as follows:

$$P_{j_n} = \begin{cases} \tilde{P}_{j_n}(\gamma_{k_0}) = \gamma_{k_0} \dfrac{N_0}{g_{j_n}} & \text{if } n \le s_{k_0} \\ 0 & \text{if } n > s_{k_0} \end{cases} .$$

10. (Original) The method of claim 1, wherein the clusters are encoded.

11. (Currently Amended) A transmitter of a communication system where sub-carriers are divided into eigenmodes, the transmitter comprising:

an estimating unit configured to estimate ~~means (300) for estimating~~ a channel matrix;

a calculating unit configured to calculate ~~means (302) for calculating~~ a singular value decomposition of the estimated channel matrix for obtaining eigenvalue estimates;

a defining unit configured to define ~~means (304) for defining~~ biases between eigenvalues and eigenvalue estimates and performing a channel estimation reliability test based on the defined biases;

a carrying unit configured to carry ~~means (304) for carrying~~ out bias compensation for eigenvalue estimates based on the defined biases;

a gain calculating unit configured to calculate ~~means (304) for calculating~~ equivalent power gain;

an arranging unit configured to arrange ~~means (304) for arranging~~ eigenmodes into a predetermined number of clusters, each cluster comprising eigenmodes of different quality levels;

a pre-allocating unit configured to pre-allocate ~~means (304) for pre-allocating~~ transmission power to the eigenmodes according to their capacity by using the calculated equivalent power gain;

a determining unit configured to determine ~~means (304) for determining~~ collective transmission power to be allocated to each cluster based on the pre-allocation; and

a selecting unit configured to select ~~means (304) for selecting~~ the optimum modulation and coding scheme and allocating collective transmission power to the eigenmodes.

12. (Currently Amended) The transmitter of claim 11, further comprising:

~~means (304) for~~a power pre-allocating unit configured to pre-allocate ~~pre-allocating~~ transmission power by using water filling or modified water filling power allocation method.

13. (Currently Amended) The transmitter of claim 11, wherein the communication system is a combined multiple-input-multiple output ~~(MIMO)~~ and orthogonal frequency division multiplexing ~~(OFDM)~~ system.

14. (Currently Amended) The transmitter of claim 11, further comprising:

~~means (304) for~~an allocating unit configured to allocate ~~allocating~~ transmission power to eigenmodes starting from the weakest cluster.

15. (Currently Amended) The transmitter of claim 11, further comprising:

~~means (304) for searching~~ a searching unit configured to search for the modulation and coding scheme ~~(MCS)~~ which ~~maximises~~maximizes the throughput under the total transmitted power and the maximum frame error rate ~~(FER)~~ constraints can be written as

$$k_0 = \arg\max_{k=1,2,\ldots,K} b_k \left(\max_{S\subset\{1,2,\ldots,C\}:\sum_{c\in S}\tilde{P}_c(\gamma_k)\le P} |S| \right) = \arg\max_k b_k s_k \,.$$

16. (Original) The transmitter of claim 11, wherein the power required at the eigenmode (i,c) in order to obtain a given target signal to noise ratio, SNR_t, is given by:

$$\tilde{P}_{i,c}(\mathrm{SNR}_t) = \mathrm{SNR}_t \frac{N_0}{g_{i,c}} \qquad .$$

17. (Original) The transmitter of claim 11, wherein according to the modified water filling, the power to be pre-allocated for an eigenmode is expressed:

$$P_{i,c}^{(\mathrm{MWF})} = \min\left[\left(\mu - \frac{N_0}{g_{i,c}} G\right)^{+}, \frac{N_0}{g_{i,c}} \gamma_K\right].$$

18. (Original) The transmitter of claim 11, wherein the powers allocated to the cluster's eigemodes are computed as follows:

$$P_{j_n} = \begin{cases} \tilde{P}_{j_n}(\gamma_{k_0}) = \gamma_{k_0} \dfrac{N_0}{g_{j_n}} & \text{if } n \le s_{k_0} \\ 0 & \text{if } n > s_{k_0} \end{cases}.$$

19. (Currently Amended) The transmitter of claim 11, further comprising:

~~means (306A-306B) for~~an encoding unit configured to encode ~~encoding~~ clusters.

20. (Currently Amended) A transmitter of a communication system where sub-carriers are divided into eigenmodes, configured to~~:~~

estimate a channel matrix,~~;~~

calculate a singular value decomposition of the estimated channel matrix for obtaining eigenvalue estimates~~;~~,

define biases between eigenvalues and eigenvalue estimates and performing a channel estimation reliability test based on the defined biases~~;~~,

carry out bias compensation for eigenvalue estimates based on the defined biases~~;~~,

calculate equivalent power gain~~;~~,

arrange eigenmodes into a predetermined number of clusters, each cluster comprising eigenmodes of different quality levels~~;~~,

pre-allocate transmission power to the eigenmodes according to their capacity by using the calculated equivalent power gain~~;~~,

determine collective transmission power to be allocated to each cluster based on the pre-allocation~~;~~, and

select the optimum modulation and coding scheme and allocating collective transmission power to the eigenmodes.

21. (Currently Amended) A base station of a communication system where sub-carriers are divided into eigenmodes, the base station comprising:

an estimating unit configured to estimate ~~means (300) for estimating~~ a channel matrix;

a calculating unit configured to calculate ~~means (302) for calculating~~ a singular value decomposition of the estimated channel matrix for obtaining eigenvalue estimates;

a defining unit configured to define ~~means (304) for defining~~ biases between eigenvalues and eigenvalue estimates and performing a channel estimation reliability test based on the defined biases;

a carrying unit configured to carry ~~means (304) for carrying~~ out bias compensation for eigenvalue estimates based on the defined biases;

a gain calculating unit configured to calculate ~~means (304) for calculating~~ equivalent power gain;

an arranging unit configured to arrange ~~means (304) for arranging~~ eigenmodes into a predetermined number of clusters, each cluster comprising eigenmodes of different quality levels;

a pre-allocating unit configured to pre-allocate ~~means (304) for pre-allocating~~ transmission power to the eigenmodes according to their capacity by using the calculated equivalent power gain;

a determining unit configured to determine ~~means (304) for determining~~ collective transmission power to be allocated to each cluster based on the pre-allocation; and

a selecting unit configured to select ~~means (304) for selecting~~ the optimum modulation and coding scheme and allocating collective transmission power to the eigenmodes.

22. (Currently Amended) A base station of a communication system, where sub-carriers are divided into eigenmodes, configured to~~:~~

estimate a channel matrix~~;~~,

calculate a singular value decomposition of the estimated channel matrix for obtaining eigenvalue estimates~~;~~,

define biases between eigenvalues and eigenvalue estimates and performing a channel estimation reliability test based on the defined biases~~;~~,

carry out bias compensation for eigenvalue estimates based on the defined biases~~;~~,

calculate equivalent power gain~~;~~,

arrange eigenmodes into a predetermined number of clusters, each cluster comprising eigenmodes of different quality levels~~;~~,

pre-allocate transmission power to the eigenmodes according to their capacity by using the calculated equivalent power gain~~;~~,

determine collective transmission power to be allocated to each cluster based on the pre-allocation~~;~~, and

select the optimum modulation and coding scheme and allocating collective transmission power to the eigenmodes.

23. (New) A transmitter of a communication system where sub-carriers are divided into eigenmodes, the transmitter comprising:

estimating means for estimating a channel matrix;

calculating means for calculating a singular value decomposition of the estimated channel matrix for obtaining eigenvalue estimates;

defining means for defining biases between eigenvalues and eigenvalue estimates and performing a channel estimation reliability test based on the defined biases;

carrying means for carrying out bias compensation for eigenvalue estimates based on the defined biases;

gain calculation means for calculating equivalent power gain;

arranging means for arranging eigenmodes into a predetermined number of clusters, each cluster comprising eigenmodes of different quality levels;

pre-allocating means for pre-allocating transmission power to the eigenmodes according to their capacity by using the calculated equivalent power gain;

determining means for determining collective transmission power to be allocated to each cluster based on the pre-allocation; and

selecting means for selecting the optimum modulation and coding scheme and allocating collective transmission power to the eigenmodes.

24. (New) A base station of a communication system where sub-carriers are divided into eigenmodes, the base station comprising:

estimating means for estimating a channel matrix;

calculating means for calculating a singular value decomposition of the estimated channel matrix for obtaining eigenvalue estimates;

defining means for defining biases between eigenvalues and eigenvalue estimates and performing a channel estimation reliability test based on the defined biases;

carrying means for carrying out bias compensation for eigenvalue estimates based on the defined biases;

gain calculation means for calculating equivalent power gain;

arranging means for arranging eigenmodes into a predetermined number of clusters, each cluster comprising eigenmodes of different quality levels;

pre-allocating means for pre-allocating transmission power to the eigenmodes according to their capacity by using the calculated equivalent power gain;

determining means for determining collective transmission power to be allocated to each cluster based on the pre-allocation; and

selecting means for selecting the optimum modulation and coding scheme and allocating collective transmission power to the eigenmodes.